SBRT inmobilization radiation oncology service experience

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Introduction. The aim of the exracranial stereotactic technique (SBRT) is the administration in few sessions of high doses of radiation to a reduced volume adjacent to critical organs. This technique needs a very precise immobilization and a way to reproduce it daily with ease.
Target. To explain the different immobilization systems used in radiation oncology service ICO Duran Reynals since this technique was first used until the latest technique used today.
Methodology. We started using the technique in 2008. We have used several immobilization procedures since then. And each treatment session quality control images were taken and analyzed to measure the deviations occurred from the longitudinal, lateral and vertical isocenter.
Conclusions. We have observed that with the different locking systems used during the time period of 2008–2013 we were able to gradually reduce the deviation from the isocenter. In conclusion, a good immobilization procedure assures us a more precise treatment consisting of smaller fields and closer to organs at risk.

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SBRT: Technical implementation of the radiation oncology service

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Objective. To introduce the technique of SBRT in radiotherapy service.
Introduction. Extracranial stereotactic radiation therapy is a form of high-precision radiotherapy treatment using hypofractionated ablative radiation dose, 1–5 fractions, stereotactic-techniques with 3D conformal radiotherapy (3D-CRT) or intensity modulated radiotherapy (IMRT), image-guided-radiotherapy (IGRT) before each fraction.
Methods. In March 2012 we began the implementation of SBRT. Patient were selected if oligometástasis (controlled primary tumor and metastasis in numbers $\leq$3, located in the same), life-expectancy > 6 months and -PS < 2. The process comprising: 1. Interventional Radiology Department inserts a fiducial-marker (Visicoil®, all-CT except guided ultrasound in 2 cases). Is placed at a distance < 5 cm of the metastatic lesion and the patient remains under observation 24 h if metastases are lung (no-pneumothorax), otherwise referred to its home at 6-o'clock insertion. 2. Immobilization abdominal-compressor system Body-Pro-Lock® indexed to the treatment-table and the marking and tattooing TAC-referenced. 3. Acquisition in 4DPET/CT with Philips-Gemini-TF gating to liver damage or CT-if pulmonary gating, both with abdominal compression system. 4D-acquired in both the PET and the CT. Perform a takeover of CT in a situation of normal breathing. 4D acquisitions are used-to contour the GTV-following the movement of the respiratory cycle. 4. Fuse with the planning-system PhilipsPinnacle8.0 with CT-obtained in normal breathing. This acquisition is for outline planning treatment and risk-organs. 5. We determined ITV-and-PTV margin expansion ranged from 3 to 5 mm. 6. Treatment given in Siemens-Linear-Accelerator, -with built-imaging-equipment (ExacTrac) being-acquired stereoscopic images that are fused to the DRR-planning and adjusts automatically to the correct position.
Results. Since March 2012 we have treated-6 patients-(4 liver-metastases and 3 lung; 1 patient twice, lung and liver-metastases), dose 36–12 Gy/session, 3 sessions/week (except the first patient: 50–5 Gy −10 sessions on alternate days). One-patient-died due to disease progression and 5 remaining stable. Immediate-tolerance: acute toxicity, vs. 3 CTC criteria, G2-asthenia in 2 patients and no toxicity in the rest.
Conclusions. SBRT treatment modality is a high precision, which is evolving. Its effectiveness is proven in lung carcinoma non-small-cell, lung metastases, liver and spine. Our initial experience confirms the feasibility of its application and usefulness in our midst.

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Single center experience on vertebral radiosurgery with novalis and IMRT/IGRT

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Objective. Analyze the results of single dose RS to spinal metastases without spinal cord compression.
Methods. In our institution vertebral metastasis treatment is performed by a Novalis® LINAC (BrainLab, Germany). The Novalis® utilizes image registration of anatomical structures such as vertebral bone in a non-invasive procedure. Images are taken on the simulation CT, with body vacuum-bag, using infrared external fiducials on the patient's skin, CT images are contouring module on planning system (iPlan-Net.v5.1®) fussed with a volumetric T1 and T2 weighted MRI. The external fiducials are tracked by the

infrared cameras of the ExacTrac® system for automatice treatment position. IGRT is performed before each treatment field. The 6D robotic couch allows translational and rotational corrections. Sliding Windows IMRT treatment is administered with multiple coplanar beams.

Results. From November/2008 to January/2013, we have treated 17 patients with 22 spine metastasis, all the patients received single 18 Gy, GTV is contoured as the entire body of the vertebra and/or the affected transverse and spinous processes, PTV is obtained by expanding 2–3 mm GTV. OARs dose constrains are based on RTOG-0631 protocol. The location of the vertebral metastasis was: cervical 5, thoracic 9, lumbar 8; none of the patients have had prior radiotherapy on the treatment field. 8 patients (47.05%) have pain VAS $\geq$ 5. With a median follow up of 17.6 months (0.5–43.5), 20 tumors had local control after treatment. No grade III toxicity was found, total pain control was achieved in 70% of the patients, with a pain reduction in 90% (median months from the treatment 3.8 weeks).

Conclusions. Vertebral radiosurgery is safe an accurate for spinal metastases, achieving fast and good results in pain and tumoral control.

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Single fraction radiosurgery using RapidArc® for the treatment of intracranial metastases

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Purpose. To present preliminary experience in the treatment of CNS metastases with radiosurgery, using multiple non-coplanar arcs with RapidArc®.

Methods. From June to December 2012 ten patients were included (7 patients with single mts, 2 with two mts, and one pts with 4 mts). Mean age was 65 yo. (57–79). Primary tumour was: lung 6, breast 2, colon 1, prostate 1. ECOG distribution: 0:1; 1:5; 2:3; 3:1. Only two patients have evidence of metastases outside of CNS with minimal burden. Immobilization was performed with thermoplastic mask and CT simulation with slices of 1.5 mm. Treatment consists of 4–5 non-coplanar arcs (VMAT) with different table rotation (0, 60, 30, 330 and 360°). Prescription dose ranged from 12 to 18 Gy. Dosimetric objectives were: 99% of PTV and 100% of GTV must received 100% of prescription dose. Quality of treatment planning was evaluated with Paddick index, homogeneity index and gradient index. Geometric verification was made with cone beam CT. Median PTV was 6.6 cm^3 (0.4–36 cm^3).

Results. Dosimetric results: Quality index were superior compared to other techniques (cones, tomotherapy, and cyberknife). Total treatment time (median): 29 + 8 min. Clinical results: Acute toxicity: there were two case of mild hemiparesia, and one case of headache. Local control: only one patient showed local progression. Regional control: two patients developed other CNS metastases and were rescued with another radiosurgery, and one patient developed multiple CNS metastases requiring holocraneal irradiation. Three patients were deceased because of disease progression. Seven patients were alive after a mean follow-up of 17 weeks.

Conclusions. Single fraction radiosurgery with RapidArc® with multiple non-coplanar arcs showed high accuracy and quality. Toxicity was mild and early results are comparable with other radiosurgery techniques.

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Stereotactic ablative radiotherapy delivered by helical tomotherapy for extracraneal oligometastasis

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Purpose. Several recent studies have shown that a subset of patients with metastatic cancer in limited organs may benefit from metastasis-directed therapy.

Aim. We present a series on patients treated with stereotactic tomotherapy (HT), and assess the efficacy and toxicity of this new technology in the treatment of extracraneal oligometastasis.

Materials and methods. From August 2006 through July 2011, 42 consecutive patients (median age 69 years) with 1–3 metastatic cancer sites received HT to all known cancer sites (lung, $n = 28$; liver, $n = 12$; adrenal, $n = 2$). Twenty-seven patients (64%) had a single lesion, 12 patients (29%) 2 lesions, and 3 patients (7%) 3 lesions. Acute toxicities were scored using the Common Terminology Criteria version 3.0.

Results. A total of 60 lesions were treated with hypofractionated HT (median dose 39 Gy [range 36–72.5]; median dose per fraction 12 Gy [range, 5–20]). With a median follow-up period of 15 months (range 2–57), 1- and 2-year overall survival (OS) was 84% and 63%, respectively; and 1- and 2-year local control (LC) was 92% and 86%, respectively. Regarding treatment-related acute